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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
GRAHAM, ANDREW R	
ART UNIT	**PAPER NUMBER**
2644	

DATE MAILED: 12/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/270,768	SIBBALD ET AL.	
	Examiner	Art Unit	
	Andrew Graham	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10 and 13-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-10 and 13-15* is/are rejected.

7)☒ Claim(s) *3* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, filed September 8, 2005 with respect to claims 1-10 and 13-15 have been fully considered but are not persuasive as detailed below.

On page 8, lines 20-22, the applicant has stated, "Gardner makes no teaching or suggestion wherein any processing equivalent to high frequency cut filtering is performed for virtual source positions in the rearward hemisphere". The examiner respectfully disagrees. Gardner discloses "A precomputed set of gains g_L and g_R are established for numerous combinations of listening geometries and source locations and stored in a database for realtime retrieval and application" (col. 17, lines 24-27). Said gains are a part of the affected "high cut filtering" of Gardner (col. 17, lines 24-42). By virtue of the source locations in the teachings of Gardner being in both the forward and rearward hemispheres (0-180° degree incidence angles considered, for example, col. 13, lines 3-25), said "source locations" of Gardner in the above cited passage include "virtual source positions in the rearward hemisphere" as well. Thus, the disclosed set of gains of Gardner yet reads on "using high frequency cut filtering for virtual sound source positions in the rearward hemisphere". It is respectfully submitted that the pending claim language, though different from that which was previously pending, does not provide patentable distinction between the teachings of Gardner as applied previously, when considered in view of the above response to the

submitted remarks. As such, the rejection of the claims in view of Gardner, reflecting the amended claim language, is repeated as is presented below.

An additional set of rejection is also presented below regarding the reference of Fujita et al (USPN 6035045).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. **Claims 1, 4, 5, 7-10, and 13-15** are rejected under 35 U.S.C. 102(e) as being anticipated by Gardner (USPN 6243476 B1).

Gardener teaches a system for addressing high frequency crosstalk in a virtual sound source reproduction system.

Specifically regarding **Claim 1**, Gardner teaches:

A method (function performed by system) of processing a single channel audio signal (input of single sound source x; col. 4, lines 5-19; col. 5, lines 56-63; col. 10, lines 22-26) to provide an audio

signal (output of 115_L,115_R) having left and right channels (Y_L,Y_R)(col. 10, lines 29-30; col. 11, lines 10-12) corresponding to a virtual sound source (sounds, such as s_1) at a given direction ("spatial location") in space relative to a preferred position of a listener in use (spatial locations appear to listener LIS, col. 10, lines 48-52),

the space including a forward hemisphere and a rearward hemisphere relative to said preferred position (three dimensional audio, col. 18, lines 1-4; azimuths from 0 to 180° considered; Figures 4,9; col. 13, lines 21-25),

the information in the channels including cues for perception of the direction of said single channel audio signal from said preferred position (by virtue of binaural synthesis, col. 4, lines 19-26),

the method including the steps of:

i) providing a two channel signal (splitting or dual path application of input x, Figure 14) having the same single channel audio signal (x) in each of the two channels(col. 14, lines 47-50); and

ii) binaural processing the two channel signal (two path inputs of x) using one of a plurality of head response transfer functions (HRTF)(filter values stored in table and interpolation unit 130, selected based on relative orientations, col. 5, lines 20-24; col. 12, lines 43-67) to provide a right signal (X_R) in one channel for the right ear of a listener (output through 350_R) and a left signal (X_L) in the other channel for the left ear of the listener (output through 350_L)(col. 14, lines 47-65; Figure 14);

wherein the binaural processing ($300_L, 300_R$) of the two channel signal is augmented using high frequency (HF)-cut filtering (as a part of the function of 400L, 400_R) for virtual source positions in the rearward hemisphere(gains are established for various source locations, col. 17, lines 24-27; source locations in the system of FGardner include azimuths of 90-180° as is evidenced by Figure 9 and the above citations, such as col. 13, lines 3-24; col. 7, lines 30-32),

the degree of the HF-cut filtering (the numerical value of the applied gain g_L or g_R) being settable according to the given direction of the virtual sound source relative to said preferred position(gains are established at least in part on source locations, col. 17, lines 21-28).

Regarding **Claim 4**, Gardner teaches:

the left and right channel signals (outputs of $400_L, 400_R$, Figure 15) are processed by transaural crosstalk cancellation means in order to give loudspeaker compatible signals (col. 17, lines 64-67).

Regarding **Claim 5**, Gardner teaches:

the degree of HF-cut filtering (by $400_L, 400_R$) is determined by filter coefficients (g_L, g_R) set according to a function of the angle of azimuth and the angle of elevation of the virtual sound source (inherent, 3-dimensional sound set according to source locations and listening geometry; col. 17, li21-28; col. 18, lines 1-4).

Regarding **Claim 6**, Gardner teaches:

the amount of HF-cut filtering (gain of $400_L, 400_R$) is substantially the same for virtual sound sources placed at positions on the rear hemisphere which are equidistant from azimuth ±180° and elevation 0° relative to the preferred position of the listener (inherent, gains derived from HTRFs, for virtual sources outside physical speaker locations, total power transfer into two ears equals total power transfer in the HRTFs, KEMAR head shadowing is symmetrical; col. 15, lines 42-60; col. 16, lines 3-49)

Regarding **Claim 7**, Gardner teaches:

the degree of HF-cut filtering (by $400_L, 400_R$) is determined by filter coefficients set via a look-up table (database format, col. 17, lines 24-28).

Regarding **Claim 8**, Gardner teaches:

the HF-cut filtering is performed (by $400_L, 400_R$) in series with an HRTF (Figure 15).

Regarding **Claim 9**, Gardner teaches:

an HRTF is convolved with an HF-cut filter to produce a modified HRTF (equation 31, col. 16, lines 5-15).

Regarding **Claim 10**, please refer to the above rejection of the method recited in Claim 1, noting that Gardner teaches:

including signal processing means (DSP equipment)(col. 5, lines 30-55), HRTF filter means (300L,300R), HF-cut filter means (400L,400R) and a means (database, such as part of 130) for determining HF-cut filter coefficients as a function of the direction of the virtual sound source (col. 17, lines 21-42).

Regarding **Claim 13**, please see the above rejection of the similar limitations of Claim 1, noting that the system may be implemented as software running on a general purpose computer (col. 5, lines 33-39).

Regarding **Claim 14**, please refer to the above rejection of similar limitations of Claim 1, noting that the system of Gardner produces an audio signal, such as a sound s_1 (col. 10, lines 48-52).

Regarding **Claim 15**, please refer to the above rejection of similar limitations of Claims 1 and 10.

3. **Claims 1-2, 4, 5, 7-8, 10, and 13-15** are rejected under 35 U.S.C. 102(e) as being anticipated by Fujita et al (USPN 6035045 A), hereafter "Fujita".

Fujita discloses a sound image control apparatus implementing left and right head related transfer functions.

Specifically regarding **Claim 1**, Fujita teaches:

A method of processing a single channel audio signal (input Figure 3, col. 12, lines 48-51)

to provide an audio signal having left and right channels (col. 12, lines 55-57; output of 11, Figure 3)

corresponding to a virtual sound source at a given direction in space relative to a preferred position of a listener in use (angles are relative to user, Figure 2; direction from CPU, col. 12, lines 51-55; col. 19, lines 6-27),

the space including a forward hemisphere and a rearward hemisphere relative to said preferred position (three dimensional space, col. 1, lines 12-18),

the information in the channels including cues for perception of the direction of said single channel audio signal from said preferred position (col. 19, lines 6-27), the method including the steps of:

i) providing a two channel signal having the same single channel audio signal in each of the two channels (delayed versions of same signal are in both outputs of 11, col. 12, line 64 - col. 13, line 11); and

ii) binaural processing the two channel signal using one of a plurality of head response transfer functions (HRTF)(function of 13, col. 14, line 22 - col. 17, line 42; filter values vary according to position data; also see Figure 22, elements 32,33, col. 25, line 42 - col. 27, line 47)

to provide a right signal in one channel for the right ear of a listener and a left signal in the other channel for the left ear of the listener (output of 13 to headphones, col. 19, lines 13-49)

wherein the binaural processing of the two channel signal is augmented (sound quality, as affected by 13, is corrected by 10)

using high frequency (HF)-cut filtering (function of 10, comprising processing of low pass filtering 100 and gain 101, col. 18, lines 14-16) for virtual source positions in the rearward hemisphere (gain of 101 operates for 90-180°, Figure 13, col. 18, lines 54-67),

the degree of the HF-cut filtering being settable according to the given direction of the virtual sound source relative to said preferred position (amount of gain shown in Figure 13, col. 18, lines 62-65).

Regarding **Claim 2**, Fujita teaches:

the amount of HF-cut filtering is at a maximum for virtual sound sources placed directly behind the preferred position of the listener, that is, at a direction of azimuth +180° and elevation 0° relative to the preferred position of the listener (gain is maximum at 180°, Figure 13; as image is localized in 3d space, col. 19, lines 6-12, the maximum value shown in Figure 13 includes elevations), and

the amount of HF-cut filtering progressively decreases as the forward hemisphere is approached (decrease shown before 90° in Figure 13).

Regarding **Claim 4**, Fujita teaches:

the left and right channel signals (outputs of 1, Figure 14) are processed by transaural crosstalk cancellation means (Figure 15) in order to give loudspeaker compatible signals (col. 19, lines 60-67; col. 20, lines 1-9).

Regarding **Claim 5**, Fujita teaches:

the degree of HF-cut filtering is determined by filter coefficients (settings of 101) set according to a function of the angle of azimuth and the angle of elevation of the virtual sound source (3-dimensional sound set according to source location data, col. 18, lines 16-19; col. 19, lines 6-12).

Regarding **Claim 6**, Fujita teaches:

the amount of HF-cut filtering (gain of 101) is substantially the same for virtual sound sources placed at positions on the rear hemisphere which are equidistant from azimuth ±180° and elevation 0° relative to the preferred position of the listener (filtering applied commonly, thus symmetrically, to input signals, Figure 3)

Regarding **Claim 7**, Fujita teaches:

the degree of HF-cut filtering (by 10) is determined by filter coefficients set via a look-up table (data memory, col. 25, lines 42-56).

Regarding **Claim 8**, Fujita teaches:

the HF-cut filtering (by 10) is performed in series with an HRTF (13) (Figures 3,22; col. 26, lines 40-44).

Regarding **Claim 10**, please refer to the above rejection of the method recited in Claim 1, noting that Fujita teaches:

including signal processing means (DSP)(col. 12, lines 38-48), HRTF filter means (13 or 32,33), HF-cut filter means (10) and a means (data memory) for determining HF-cut filter coefficients as a function of the direction of the virtual sound source (col. 25, lines 42-64).

Regarding **Claim 13**, please see the above rejection of the similar limitations of Claim 1, noting that the system may be implemented as software running on a DSP (col. 12, lines 46-48).

Regarding **Claim 14**, please refer to the above rejection of similar limitations of Claim 1, noting that the system of Fujita produces an audio signal(col. 19, lines 22-27).

Regarding **Claim 15**, please refer to the above rejection of similar limitations of Claims 1 and 10.

Allowable Subject Matter

4. **Claim 3** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Graham whose telephone number is 571-272-7517. The examiner can normally be reached on Monday-Friday, 8:30 AM to 5:00 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached at 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Andrew Graham

Examiner
A.U. 2644

AG
ag
November 28, 2005

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